UvA HPC Course

HPC CLOUD WORKSHOP

UvA HPC Course 2016.06.15
Anatoli Danezi, Ander Astudillo, Markus van Dijk, Nuno Ferreira
09:30 SURFsara HPC Cloud Introduction (N. Ferreira)
10:15 Hands-on : Parts A & B
12:00 Lunch
13:00 Cloudifying - parallelism & API (A. Astudillo)
13:45 Hands-on : Extras
17:00 End

24th June
“High Performance Computing made easy”

Objective
- Enhance accessibility to HPC facilities
- Set lectures with hands-on workshops
- Develop practical skills

Audience
- Students
- Researchers

Accountability ¹
- Bachelor / Master students (6 ECTS)
- Assignments ²: ‘Food for Brain’ questions (afternoon)

¹ UvA HPC Course
² Course asignements
Who are We?
SURF ensures that students, lecturers, researchers and employees in education and research have access to the best possible ICT resources on favourable terms for the purpose of top-level research and talent development, including in national and international collaborative efforts.¹

Why use national infrastructures?
Scalability, Collaboration, Heterogeneity

What do we (SURFsara) want to offer?
Computing and Data services for research

¹ SURF Strategic Plan for 2015-2018
Cloud Computing
“Ask 10 people what the cloud is, get 11 answers.”

Essential Characteristics
- On-demand self-service, Network access, Resource pooling, Elasticity, Measured

Service Models
- SaaS, PaaS, IaaS

[1]. The NIST Definition of Cloud Computing
* as a Service

<table>
<thead>
<tr>
<th>SaaS (software)</th>
<th>✔</th>
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<tbody>
<tr>
<td>PaaS (platform)</td>
<td>✔</td>
<td>✔</td>
<td>✗</td>
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<tr>
<td>IaaS (infrastructure)</td>
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“Say Cloud one more time …”
# SURFsara Computing service

<table>
<thead>
<tr>
<th></th>
<th>Cartesius</th>
<th>LISA</th>
<th>Grid</th>
<th>HPC Cloud</th>
<th>Hadoop</th>
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<tbody>
<tr>
<td><strong>The machine</strong></td>
<td><img src="image" alt="Cartesius" /></td>
<td><img src="image" alt="LISA" /></td>
<td><img src="image" alt="Grid" /></td>
<td><img src="image" alt="HPC Cloud" /></td>
<td><img src="image" alt="Hadoop" /></td>
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<tr>
<td>Cores</td>
<td>40,960</td>
<td>7856</td>
<td>5000</td>
<td>2408</td>
<td>1370</td>
</tr>
<tr>
<td>Memory</td>
<td>117 TB</td>
<td>26 TB</td>
<td>40 TB</td>
<td>21 TB</td>
<td>4 TB</td>
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<tr>
<td><em>aaS</em> PaaS / SaaS</td>
<td>GPGPU, Infiniband</td>
<td>Infiniband, Customizable workspaces</td>
<td>Scale up to European or worldwide resources</td>
<td>Own OS, GPGPU</td>
<td>Map/Reduce or Spark driven, Local storage only</td>
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<td>Unique</td>
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Infrastructure as a Service

www.definethecloud.net
Need for an HPC Cloud?

Drawbacks on SURFsara computing components

- Limited access to supercomputer
- Learning curve
- SURFsara maintains OS and SW
- Jobs are queued

Virtualisation Benefits

- Flexibility (install what you want)
- Build private cluster
- External access
- Interaction with running processes
General benefits
• Data & Computing in Dutch soil
• Data privacy inside your VM
• Unrestricted Internet access (but fair use)

Technical benefits
• No overcommitting
• Tailor made your VM to your needs
• Root access!
• Controlled environment : choose your OS & packages
• Fast private network between VM’s
• No maximum wall time
Why not HPC Cloud

- No Service Level Agreement
- No 24/7 Helpdesk service support
- You maintain everything in your VM
- You are responsible for all of your VM’s behavior
- You must protect yourself against threats from the Internet
- Accounting on VM uptime, not just compute time (like gas, light)
- No automatic backups
- Your laptop is faster than a 1 core VM
From the user perspective
SURFsara HPC Cloud workshop 2016.06.15

Interacting with the HPC Cloud

1 - Access infrastructure (UI)
2 - Instantiate VM(s)
3 - Access VM
4 - Share VM access
Creating a VM from scratch can be a lot of work, we provide an “app market”.

**Import an appliance:**
- CentOS or Ubuntu

**Imported OS image:**
- copied to node-local SSD
- persistency yes/no (run-time changes copied back or not)

**Imported template (VM assembling instructions):**
- # cores, RAM, Internet and/or private lan
- additional data images on Ceph storage

**Boot the VM and log in with SSH.**
Take care of firewalls, security, updates etc., importing an appliance is just a set-up help.
How to obtain an HPC Cloud account?

1. Resource Request
2. Technical Evaluation
3. Cloud Project
4. Access Granted

Helpdesk

T: hours to a few days

1 Resource Request form
2 helpdesk@surfsara.nl
HPC Cloud Resource requests

Number of requests\(^1\): 87 (circa 16 / month)

Research fields:
- Biology
- Genetics
- Informatics
- Chemistry
- Ecology
- Linguistics
- Robotics
- Business
- Social sciences
- Engineering
- Humanities

Use cases:
- Flexible software mix
- Big VMs
- Elasticity
- Provide a service to peers
- Software requiring licenses
- Set up, test and deploy workflows
- Training courses
- Intensive computing

\(^1\) Since Jan. 2016
www: https://doc.hpccloud.surfsara.nl/UvA-course-20160615/

tips: Work in pairs (each with your credentials on your laptop)
Follow the exercises at your own pace (Parts A&B b4 lunch)

?: Advice as a Service (just call us)

ui: https://ui.hpccloud.surfsara.nl/
username: surfcourseXY
password: hpc@cloudXY